DETAILED ACTION

Claim Objections

Claim 57 is objected to because of the following informalities: claim 57 depends upon canceled claim 1. for examination purposes, it was assumed that it was intended to depend upon the first independent claim 31. Appropriate correction is required.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

First, it is argued that Gengel fails to teach the first dielectric layer is made of silicone rubber, epoxy, resin or BCB to act as a buffer layer to release stress.

While this is true, please note that each of these are dielectric materials known to any and every skilled artisan as being conventional dielectric materials. For example, see Towle, US Patent 6,888,240, which teaches dielectrics can be epoxy resins, BCB, or silicone rubbers (4, 55+). Consequently, even though these specific materials aren't taught in Gengel, a skilled artisan would be motivated to use them because of their commonality to the dielectrics taught in Gengel and their universally accepted use as dielectric materials in general.

Next, it is argued that Quirk doesn't overcome Gengel's failure to teach using an adhesion layer between the die and the base in that Quirk doesn't teach using the

adhesion layer in the specific structure claimed, namely a fan out type wafer level package.

Please note that Quirk is used to teach that an adhesion layer is commonly used to attach a die to a base. Quirk doesn't have to show the specific structure claimed in order to show that an adhesion layer is known to be used by skilled artisans. Gengel teaches the fan out type wafer level package.

Lastly, it is argued that Gengel teaches the base to be made of thermally conductive material such as aluminum, or other metals or metal alloys, including copper, copper-beryllium alloys, molybdenum, nickel, INVAR, INCONEL (see column 4, lines 5-22). In contrast, the claimed "first dielectric layer" (claim 30) is formed on a base that may be comprised of such materials as glass, silicon, ceramic and crystal materials (see dependent claim 39).

Please note that this difference was addressed in the previous office action on page 8.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 30, 31, 37-41, 48, 50 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gengel, US Patent 6,417,025.

Gengel (figure 4A-4N) teaches a fan out type package structure, comprising:

a base [406];

a die [410] having a plurality of pads on a top surface that is opposite a bottom surface;

a first dielectric layer [404] formed on said base and filling in a space except said first die on said base;

a second dielectric layer [412] formed on said first dielectric layer and said first die, wherein said second dielectric layer includes a plurality of opening [414] for contact with said plurality of pads;

a contact conductive layer [416] formed on said plurality of pads of said die and within said opening to electrically couple with said pads, respectively;

a plurality of conductive lines [416] formed on said second dielectric layer and in contact with said contact conductive layer substantially filling said opening, and said conductive lines extended out from corresponding said contact conductive layer to corresponding end points;

an isolation layer [420] formed on said conductive lines and said second dielectric layer; and

solder balls [424] passing through said isolation layer and welded on said conductive lines for coupling said conductive lines, respectively.

As to the first dielectric layer being made of silicone rubber, epoxy, resin or BCB to act as a buffer layer to release stress, while Gengel fails to teach these materials, it would have been obvious to one of ordinary skill in the art at the time of the invention to use these materials in the invention of Gengel because these materials are known equivalent materials to the ones taught in Gengel and are also are commonly known and used dielectric materials, as evinced by Towle, US Patent 6,888,240 (4, 55+).

Regarding the limitation of the contact conductive layer and the conductive lines are both presumed to be separate layers. While Gengel fails to teach the use of two separate layers, the transposition of process steps or the splitting of one step into two,

where the processes are substantially identical or equivalent in terms of function, manner and result, was held to not patentably distinguish the processes [Ex parte Rubin 128 USPQ 440 (PTOBdPatApp 1959)]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the two separate steps in the invention of Gengel because one can better control the flow of the conductive material into the opening when performed separately.

Further, in a product claim, only the final structure is considered. Therefore, how one arrived at a structure wherein the contact conductive layer and the conductive lines are formed is not given any patentable weight. All that is required is a structure having a contact conductive layer in an opening and a conductive line coupled thereto. The fact that Gengel teaches forming them at the same time and the claims intend to have them formed separately is not given any patentable weight. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

With respect to the limitation that the contact conductive layer substantially fill the opening, the partial filling of the opening taught be Gengel and the presently claimed substantially filled opening are equivalent techniques used to form a contact in an opening in order to electrically connect the underlying pad to the conductive line formed

above the contact conductive layer. They are interchangeable techniques used to perform this function. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

As to the limitation requiring an adhesion material between the die and the base, the use of conventional materials to perform their known functions is obvious (MPEP 2144.07). An adhesion layer is conventionally known to skilled artisans and is used to attach a die to a substrate, as evinced by Quirk et al., Semiconductor Manufacturing Technology, Prentice-Hall, 2001, p 576.

Regarding claim 31, Gengel teaches the surfaces of said first dielectric layer and said first die are at same level (figure 4N).

Regarding claim 37, Gengel teaches said first contact conductive layer comprises Ti, Cu, and the combination thereof (5, 63+).

With respect to claim 38, Gengel teaches said first conductive lines comprise Ni, Cu, Au, and the combination thereof (5, 63+).

As to claim 39, while Gengel, which teaches a thermally conductive (4, 9+ & 18+) isolating base, fails to teach a material of said isolating base is glass, silicon, ceramic, or crystal material, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an isolating base made of glass, silicon, ceramic, or crystal material because all of these materials are commonly known materials used as an

isolation base. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

In re claim 40, while Gengel fails to teach an epoxy layer formed on back surface of the base, it would have been obvious to one of ordinary skill in the art at the time of the invention to form an epoxy layer on the back of the base because it is conventionally known in the art. A skilled artisan would form an epoxy layer on the back of the base in order to protect the base during the dicing process. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Regarding claim 41, while Gengel teaches the isolating layer is made of silicon dioxide, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an epoxy, resin or combinations thereof as the isolating layer in the invention of Gengel because they are equivalent materials known to skilled artisans to be used in this manner. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

With respect to claim 48, while Gengel fails to teach the said first die is formed by sawing a processed base and adhered to said base by a picking and placing system,

this is a product-by-process limitation. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698,227 USPQ 964, 966 (Fed. Cir. 1985). Further, acquiring a die from a process that saws the die from a base and adheres it to said base by a picking and placing system is conventionally known in the art.

In re claim 50, while Gengel fails to teach adhesion material includes thermally conductive material, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a thermally conductive adhesion material in the invention of Gengel because a thermally conductive adhesion material is conventionally known in the art to skilled artisans. The use of conventional materials to perform their known functions is obvious (MPEP 2144.07).

Regarding claim 57, while Gengel fails to teach the use of silicone rubber, it would have been obvious to one of ordinary skill in the art at the time of the invention to use silicone rubber in the invention of Gengel because silicone rubber is a known equivalent material to the ones taught in Gengel and also are commonly known and used dielectric materials, as evinced by Towle, US Patent 6,888,240 (4, 55+).

Claims 51-54, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gengel, US Patent 6,417,025.

Gengel (figure 4A-4N) teaches a fan out type wafer level package structure, comprising:

a base [406];

a die [410] having a plurality of pads on a top surface that is opposite a bottom surface;

a first dielectric layer [404] formed on said base and filling in a space except said first die on said base;

a second dielectric layer [412] formed on said first dielectric layer and said first die, wherein said second dielectric layer includes a plurality of opening [414] for contact with said plurality of pads;

a contact conductive layer [416] formed on said plurality of pads of said die and within said opening to electrically couple with said pads, respectively;

a plurality of conductive lines [416] formed on said second dielectric layer and in contact with said contact conductive layer substantially filling said opening, and said conductive lines extended out from corresponding said contact conductive layer to corresponding end points;

an isolation layer [420] formed on said conductive lines and said second dielectric layer; and

solder balls [424] passing through said isolation layer and welded on said conductive lines for coupling said conductive lines, respectively.

Regarding the limitation of the contact conductive layer and the conductive lines are both presumed to be separate layers. While Gengel fails to teach the use of two

separate layers, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to not patentably distinguish the processes [Ex parte Rubin 128 USPQ 440 (PTOBdPatApp 1959)]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the two separate steps in the invention of Gengel because one can better control the flow of the conductive material into the opening when performed separately.

Further, in a product claim, only the final structure is considered. Therefore, how one arrived at a structure wherein the contact conductive layer and the conductive lines are formed is not given any patentable weight. All that is required is a structure having a contact conductive layer in an opening and a conductive line coupled thereto. The fact that Gengel teaches forming them at the same time and the claims intend to have them formed separately is not given any patentable weight. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

With respect to the limitation that the contact conductive layer substantially fill the opening, the partial filling of the opening taught be Gengel and the presently claimed substantially filled opening are equivalent techniques used to form a contact in an

opening in order to electrically connect the underlying pad to the conductive line formed above the contact conductive layer. They are interchangeable techniques used to perform this function. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

As to the limitation requiring an adhesion material between the die and the base, the use of conventional materials to perform their known functions is obvious (MPEP 2144.07). An adhesion layer is conventionally known to skilled artisans and is used to attach a die to a substrate, as evinced by Quirk et al., Semiconductor Manufacturing Technology, Prentice-Hall, 2001, p 576.

In re the first dielectric layer being a buffer layer made of silicon rubber, epoxy, resin or BCB to act as a buffer layer to release the stress, while Gengel fails to teach the use of a buffer layer, it would have been obvious to one of ordinary skill in the art at the time of the invention to use silicon rubber, epoxy, resin or BCB in the invention of Gengel because silicon rubber, epoxy, resin or BCB are known equivalent dielectric materials. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air

Products Co. 85 USPQ 328 (USSC 1950). As evinced by Towle, US Patent 6,888,240 (4, 55+).

Regarding claims 52 and 53, while Gengel, which teaches the use of Cu, Ag, Au, Cr, etc and the use of more than one metal (5,63 - 6, 10), fails to teach the contact layer comprise Ti and Cu (claim 52) and the conductive lines comprise Cu, Ni and Au (claim 53), it would have been obvious to one of ordinary skill in the art at the time of the invention to use Ti and Cu contact layers and Cu, Ni and Au conductive lines in the invention of Gengel because both Ti and Cu contact layers and Cu, Ni and Au conductive lines are conventionally known in the art materials used to form a contact layers and conductive lines. Skilled artisans know that Ti, Cu Ni and Au are conventional materials used to form interconnection layers. The use of conventional materials to perform their known functions is obvious (MPEP 2144.07).

In re claim 54, while Gengel fails to teach adhesion material includes thermally conductive material, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a thermally conductive adhesion material in the invention of Gengel because a thermally conductive adhesion material is conventionally known in the art to skilled artisans. The use of conventional materials to perform their known functions is obvious (MPEP 2144.07).

Regarding claim 58, while Gengel fails to teach the use of silicone rubber, it would have been obvious to one of ordinary skill in the art at the time of the invention to use silicone rubber in the invention of Gengel because silicone rubber is a known

equivalent material to the ones taught in Gengel and also are commonly known and used dielectric materials, as evinced by Towle, US Patent 6,888,240 (4, 55+).

Claims 55-56, and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gengel, US Patent 6,417,025.

Gengel (figure 4A-4N) teaches a fan out type wafer level package structure, comprising:

a base [406];

a die [410] having a plurality of pads on a top surface that is opposite a bottom surface;

a first dielectric layer [404] formed on said base and filling in a space except said first die on said base;

a second dielectric layer [412] formed on said first dielectric layer and said first die, wherein said second dielectric layer includes a plurality of opening [414] for contact with said plurality of pads;

a contact conductive layer [416] formed on said plurality of pads of said die and within said opening to electrically couple with said pads, respectively;

a plurality of conductive lines [416] formed on said second dielectric layer and in contact with said contact conductive layer substantially filling said opening, and said conductive lines extended out from corresponding said contact conductive layer to corresponding end points;

an isolation layer [420] formed on said conductive lines and said second dielectric layer; and

solder balls [424] passing through said isolation layer and welded on said conductive lines for coupling said conductive lines, respectively.

Regarding the limitation of the contact conductive layer and the conductive lines are both presumed to be separate layers. While Gengel fails to teach the use of two separate layers, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to not patentably distinguish the processes [Ex parte Rubin 128 USPQ 440 (PTOBdPatApp 1959)]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the two separate steps in the invention of Gengel because one can better control the flow of the conductive material into the opening when performed separately.

Further, in a product claim, only the final structure is considered. Therefore, how one arrived at a structure wherein the contact conductive layer and the conductive lines are formed is not given any patentable weight. All that is required is a structure having a contact conductive layer in an opening and a conductive line coupled thereto. The fact that Gengel teaches forming them at the same time and the claims intend to have them formed separately is not given any patentable weight. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product

was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

With respect to the limitation that the contact conductive layer substantially fill the opening, the partial filling of the opening taught be Gengel and the presently claimed substantially filled opening are equivalent techniques used to form a contact in an opening in order to electrically connect the underlying pad to the conductive line formed above the contact conductive layer. They are interchangeable techniques used to perform this function. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

As to the limitation requiring an adhesion material between the die and the base, the use of conventional materials to perform their known functions is obvious (MPEP 2144.07). An adhesion layer is conventionally known to skilled artisans and is used to attach a die to a substrate, as evinced by Quirk et al., Semiconductor Manufacturing Technology, Prentice-Hall, 2001, p 576.

In re the first dielectric layer being a buffer layer made of silicon rubber, epoxy, resin or BCB to act as a buffer layer to release the stress, while Gengel fails to teach the use of a buffer layer, it would have been obvious to one of ordinary skill in the art at the time of the invention to use silicon rubber, epoxy, resin or BCB in the invention of Gengel because silicon rubber, epoxy, resin or BCB are known equivalent dielectric

materials. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Regarding the materials used for the contact layer an d the conductive lines, while Gengel, which teaches the use of Cu, Ag, Au, Cr, etc and the use of more than one metal (5,63 - 6, 10), fails to teach the contact layer comprise Ti and Cu (claim 52) and the conductive lines comprise Cu, Ni and Au (claim 53), it would have been obvious to one of ordinary skill in the art at the time of the invention to use Ti and Cu contact layers and Cu, Ni and Au conductive lines in the invention of Gengel because both Ti and Cu contact layers and Cu, Ni and Au conductive lines are conventionally known in the art materials used to form a contact layers and conductive lines. Skilled artisans know that Ti, Cu Ni and Au are conventional materials used to form interconnection layers. The use of conventional materials to perform their known functions is obvious (MPEP 2144.07).

In re claim 56, while Gengel fails to teach adhesion material includes thermally conductive material, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a thermally conductive adhesion material in the invention of Gengel because a thermally conductive adhesion material is conventionally known in the art to skilled artisans. The use of conventional materials to perform their known functions is obvious (MPEP 2144.07).

Regarding claim 59, while Gengel fails to teach the use of silicone rubber, it would have been obvious to one of ordinary skill in the art at the time of the invention to use silicone rubber in the invention of Gengel because silicone rubber is a known equivalent material to the ones taught in Gengel and also are commonly known and used dielectric materials, as evinced by Towle, US Patent 6,888,240 (4, 55+).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/David A. Zarneke/
Primary Examiner
June 7, 2008